CLAIMS

What is claimed is:

1. A hollow fiber incorporating an immobilized biological substance, a porous fiber incorporating an immobilized biological substance, or a porous hollow fiber incorporating an immobilized biological substance, wherein the biological substance is directly immobilized on and/or in the fiber.

2. A fiber retaining a gel which incorporates an immobilized biological substance whereby the biological substance is immobilized on and/or in the fiber.

3. The fiber according to claim 2, which is a solid, hollow, porous or hollow porous fiber.

4. The fiber according to claim 3, which is a solid fiber, and wherein the gel incorporating an immobilized biological substance is retained on a surface of the fiber.

5. The fiber according to claim 3, which is a hollow fiber, and wherein the gel incorporating an immobilized biological substance is retained in a hollow part of the fiber.

6. The fiber according to claim 3, which is a porous fiber, and wherein the gel incorporating an immobilized biological substance is retained in the pore(s) of the fiber.

7. The fiber according to claim 3, which is a porous hollow fiber, and wherein the gel incorporating an immobilized biological substance is retained in a hollow part and

the pore(s) of the fiber.

8. The fiber according to claim 1 or 2, wherein the biological substance is any one selected from a group consisting of the following substances (a) to (c):
   (a) nucleic acid, amino acid, sugar or lipid;
   (b) a polymer consisting of one or more kinds of ingredients from the substances stated in (a) above; and
   (c) a substance interacting with substances stated in (a) or (b) above.

9. The fiber according to claim 8, wherein the biological substance is nucleic acid.

10. The fiber according to claim 2, also having a pigment retained on and/or in the fiber by means of the gel.

11. A fiber alignment having a bundle of the fibers stated in any one of claims 1 to 10.

12. The fiber alignment according to claim 11, wherein the fibers are regularly arranged.

13. The fiber alignment according to claim 11, wherein the bundle of the fibers comprises 100 or more fibers per cross-sectional cm^2.

14. The fiber alignment according to claim 11, wherein the type of biological substance on each fiber is different in respect of some or all of the fibers.

15. A slice of the fiber of claim 11, which intersects the fiber axis of the fiber alignment according to claim 11.

16. The slice according to claim 15 comprising fiber units and coordinates reference

points therefor.

17. The slice according to claim 16, wherein the coordinate reference points are two or more marker fiber units therein.

18. The slice according to claim 17, wherein the marker fiber units are stained.

19. The slice according to claim 16, wherein the coordinates for a fiber unit are determined based on the coordinate reference points.

20. A method for producing the slice according to claim 16 having coordinates for each fiber unit thereof, the method comprising the steps of:
  (a) cutting sequentially a fiber alignment obtained by binding and immobilizing fibers, to obtain a series of fiber alignment slices S(1), S(2), ... S(h), ... S(m);
  (b) selecting any given slice S(h) from m number of slices and determining two-dimensional coordinates for each fiber unit contained in said slice S(h) based on the coordinate reference pointss in said slice S(h);
  (c) determining the two-dimensional coordinates of each fiber unit contained in slice S(i) located close to said slice S(h) based on the coordinate data of slice S(h) obtained in step (b) and the coordinate reference points in said slice S(i); and
  (d) repeating steps (b) and (c) to determine the two-dimensional coordinates of each fiber unit in said fiber alignment slice.

21. A method for determining the position of each fiber unit in the slice according to claim 16, the method comprising the steps of:
  (a) cutting sequentially a fiber alignment obtained by binding and immobilizing fibers, to obtain a series of fiber alignment slices S(1), S(2), ... S(h), ... S(m);
  (b) selecting any given slice S(h) from m number of slices and determining two-

dimensional coordinates for each fiber unit contained in said slice S(h) based on the coordinate reference pointss in said slice S(h);

(c) determining the two-dimensional coordinates of each fiber unit contained in slice S(i) located close to said slice S(h) based on the coordinate data of slice S(h) obtained in step (b) and the coordinate reference points in said slice S(i); and

(d) repeating steps (b) and (c) to determine the two-dimensional coordinates of each fiber unit in said fiber alignment slice.

22. A computer-readable recording medium on which the coordinate data of each fiber unit in the slice according to claim 16 is recorded.

23. A set for sample detection, comprising slices according to claim 16 and the recording medium according to claim 22.

24. A method for producing the slice according to claim 15, which comprises: binding a plurality of hollow fibers to make an alignment; introducing a biological substance into the inner wall and/or hollow part(s) of each hollow fiber constituting said alignment and immobilizing the substance therein; and slicing the said alignment in a direction intersecting with the fiber axis.

25. A method for producing the slice according to claim 15, which comprises: binding a plurality of porous hollow fibers to make an alignment; introducing a biological substance into the inner wall, hollow and/or porous part(s) of each porous hollow fiber constituting said alignment and immobilizing the substance therein; and slicing the said alignment in a direction intersecting with the fiber axis.

26. The method according to claim 24, wherein the immobilization of a biological substance in the inner wall and/or hollow part(s) of each hollow fiber constituting

an alignment is carried out by immersing the extended tip of each hollow fiber constituting said alignment into a solution containing a biological substance, and introducing said solution into the hollow part of each hollow fiber constituting said alignment.

27. The method according to claim 25, wherein the immobilization of a biological substance in the inner wall, hollow and/or porous part(s) of each porous hollow fiber constituting an alignment is carried out by immersing the extended tip of each porous hollow fiber constituting said alignment into a solution containing a biological substance, and introducing said solution into the hollow and/or porous part(s) of each porous hollow fiber constituting said alignment.

28. A method for producing a fiber alignment, which comprises applying tension to a fiber bundle arranged in accordance with a sequence pattern of interest, and immobilizing said fiber bundle by filling resin among fibers of said fiber bundle to make a fiber alignment.

29. The production method according to claim 28, wherein the sequence of a fiber bundle is formed by the steps of:

(c) passing fibers through a plurality of jigs having pores of the same pattern as a sequence pattern of interest; and

(d) widening the intervals between said jigs.

30. The production method according to claim 29, wherein the jigs are support lines constituting networks obtained by longitudinal and transverse lines, or a perforated board.

31. A method for treating the inner wall part of a hollow fiber, which comprises applying a gel forming monomer (a) solution on the inner wall of a hollow fiber,

and then forming gel on the inner wall of said hollow fiber by polymerization of said monomers.

32. The method according to claim 31, wherein the inner wall is porous.

33. The method according to claim 31, wherein monomer (a) is an amphipathic monomer.

34. A method for filling the hollow part of a hollow fiber with gel, which comprises filling a gel forming monomer (b) solution in the hollow part of a hollow fiber treated by any one of the methods according to claims 31 to 33, and forming gel in the hollow part by polymerization of said monomers.

35. The method according to claim 34, wherein the main ingredient of monomer (b) is acrylamide.

36. A method for producing a gel-filled fiber, which comprises filling the hollow part of a hollow fiber treated by any one of the methods according to claims 31 to 33 with a gel forming monomer (b) solution, and forming gel in the hollow part by polymerization of said monomers.

37. The production method according to claim 36, wherein the main ingredient of monomer (b) is acrylamide.

38. A polymer gel incorporating immobilized nucleic acid, wherein modified nucleic acid is bound and immobilized thereon by means of a glycidyl group.

39. The polymer gel according to claim 38, wherein the modified nucleic acid has an aminated terminus.

40. The polymer gel according to claim 38, wherein the polymer gel is a copolymer gel consisting of glycidyl(meta)acrylate, a polymerized monomer and a cross-linker.

41. The polymer gel according to claim 40, wherein the polymerized monomer is acrylamide.

42. A method for producing the polymer gel according to claim 38, which comprises reacting glycidyl(meta)acrylate with a modified nucleic acid, and then adding a polymerized monomer and a cross-linker to the obtained reaction product to polymerize them.

43. A method for producing the polymer gel according to claim 38, which comprises reacting modified nucleic acid with a copolymer gel consisting of glycidyl(meta)acrylate, a polymerized monomer and a cross- linker.

44. The production method according to claim 42 or 43, wherein the modified nucleic acid has an aminated terminus.

45. The production method according to claim 42 or 43, wherein the polymerized monomer is acrylamide.

46. A polymer gel comprising a nucleic acid ingredient, a polyvalent amine ingredient and at least two or more polymerized monomer ingredients.

47. The polymer gel according to claim 46, wherein at least one of polymerized monomer ingredients is a polymerized monomer having a glycidyl group.

48. The polymer gel according to claim 47, wherein the polymerized monomer having

a glycidyl group is glycidyl(meta)acrylate.

49. The polymer gel according to claim 46, wherein the nucleic acid ingredient has an aminated terminus.

50. A method for producing the polymer gel according to claim 46, which comprises polymerizing a solution comprising a nucleic acid ingredient, a polyvalent amine ingredient and at least two or more polymerized monomer ingredients.

51. A method for producing the polymer gel according to claim 46, which comprises polymerizing a solution comprising a nucleic acid ingredient and at least two or more polymerized monomer ingredients, and cross-linking the obtained polymer with a polyvalent amine ingredient.

52. A method for detecting a sample which comprises using the slice according to claim 15, the slice having as a probe a biological substance attached to a carrier, wherein said method comprises bringing the sample into contact with said slice by a method other than natural diffusion to form a hybrid, and removing from said slice samples which do not bind to the biological substance probe.

53. The detection method according to claim 52, wherein the sample is brought into contact with the slice by applying a voltage across said slice.

54. The detection method according to claim 52, wherein a water-absorbing substance is located on one side of said slice thereby bringing a sample located on the opposite side into contact with the slice.

55. The detection method according to claim 52, wherein the biological substance is nucleic acid.

56. The detection method according to claim 52, wherein the sample is labeled by fluorescence.

57. The detection method according to claim 52, wherein the carrier is a soluble polymer gel.

58. The detection method according to claim 57, wherein the main ingredient of the soluble polymer gel is polyacrylamide.

59. The detection method according to claim 52, wherein the carrier is retained in the hollow part of a hollow fiber.